Memorandum

To: Kristine Koch and Chip Humphrey, U.S. Environmental Protection Agency

cc: Brandy Humphries, Ryan Sudbury, and Mike Karnosh, Confederated Tribes of the Grand Ronde Community of Oregon;
Brian Cunninghame, Confederated Tribes of the Warm Springs Reservation of Oregon;
Tom Downey, Confederated Tribes of Siletz Indians;
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From: Jennifer Peers and David Allen, Stratus Consulting Inc.

Date: 7/16/2012

Subject: Comments on elements of draft Portland Harbor Feasibility Study for use in developing a Record of Decision

In response to a request from the U.S. Environmental Protection Agency (EPA), Stratus Consulting is providing these preliminary comments on the draft feasibility study (FS) for Portland Harbor (Anchor QEA et al., 2012). Stratus Consulting prepared these comments on behalf of the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce Tribe. These comments focus on broad issues that could be important in EPA's determination of the viability of all or parts of the FS to support one or more Records of Decision (RODs) for all or parts of the Portland Harbor site. They do not cover legal concerns or text edits; the five tribes expect to provide these more detailed comments about the FS subsequently. Thank you for your consideration of these comments.

Many key aspects of the draft FS appear to be sufficient for evaluating potential remedial actions in Portland Harbor, including for RODs. Most important, the underlying data in the remedial investigation (Integral Consulting et al., 2011) are technically sound and appear to be sufficient for use in risk assessments (screening, ecological, and human health) and the FS (although we support the additional collection of data to evaluate assumptions about natural attenuation). Summary information, including graphs, tables, and maps, about the location and concentration of hazardous substances in various environmental media, appears adequate and reasonable, although additional or revised analyses may be warranted in some cases (such as an improved analysis of buried contamination).

Concentration data were compared to reasonable screening and risk thresholds, which led to mostly reasonable identification of contaminants of concern, sediment hot spots, and sediment management areas (SMAs). Analysis of remedial technologies for SMAs was also mostly

reasonable, except that hydraulic dredging should be evaluated and the sequencing of work among SMAs should be reevaluated in an attempt to gain economies of scale and reduce the overall timeline for harbor-wide remediation.

However, the FS has significant deficiencies that will need to be addressed. Some of the broad deficiencies in the draft FS, in addition to the omission of hydraulic dredging, are mostly caused by unnecessary, unreliable, and distorted subjective evaluation of remedial alternatives. In particular, the FS study appears to subjectively favor, without sufficient justification, the integrated option over the removal option of each lettered alternative, and to overly emphasize short-term impacts caused by remedial activities by assuming too much time between remedial activities at each SMA. Finally, we strongly suspect that hydraulic modeling, sediment transport modeling, contaminant fate and transport modeling, and food web modeling are inadequately linked and inadequately constrained by data to predict future risks under different remedial scenarios. This leads to inappropriate conclusions about how risks will be reduced under the different remedial scenarios. Rather, each model appears useful mostly for summarizing data and data trends.

In conclusion, the raw materials of the FS appear mostly adequate, but additional evaluation of remedial alternatives is likely required to justify RODs. Most additional analyses can probably be conducted by EPA without resorting to additional data collection, additional primary analysis and mapping of data, or additional calibration and linking of models. For example, EPA could (1) eliminate or modify the subjective criteria that unreasonably favor the integrated alternatives; (2) add hydraulic dredging options and costs to each alternative based on dredging experience at other sites; (3) evaluate costs, timelines, and short-term risk scenarios that could be achieved through greater overlapping of action between SMAs; and (4) continue to rely on model outputs to summarize data and trends without trying to link and calibrate all of the models sufficiently to drive remedial decisions.

More specific comments are provided in Table 1, in the general order in which they are presented in the draft FS.

References

Anchor QEA, Windward Environmental, Kennedy/Jenks Consultants, and Integral Consulting. 2012. *Portland Harbor RI/FS Draft Feasibility Study.* Prepared for the Lower Willamette Group. March 30.

Integral Consulting, Windward Environmental, Kennedy/Jenks Consultants, and Anchor QEA. 2011. *Portland Harbor RI/FS Remedial Investigation Report.* Draft Final. Prepared for the Lower Willamette Group. August 29.

Table 1. Comments on elements of FS

Element	Opinion	Discussion
FS database	Acceptable, update	The FS database is reasonable to use as the basis of evaluations. However, more recent data from early actions should be incorporated into the dataset for the draft FS. The database for the Fate and Transport model was limited to data added as of September 10, 2009 and should be updated with all available data (see FS Section 2.8).
Conceptual site model	Acceptable, use with caution	The conceptual site model is generally appropriate and the main conclusions are reasonable. However, we have some concerns with the mass balance inputs and outputs (Figure 2.5-1) based on the Fate and Transport model. Thus we recommend that the mass balance information be used as informative but not quantitative.
Remedial action objectives (RAOs) and remedial goals (RGs)	Acceptable	We assume that this element was presented as requested by EPA and is therefore acceptable. We recommend disregarding the subjective "RG sensitivities and uncertainties" analysis presented in Section 3.6.
Applicable or Relevant and Appropriate Requirements (ARARs)	Acceptable	We assume that this element was presented as requested by EPA and is therefore acceptable.
RGs	Acceptable	We assume that this element was presented as requested by EPA and is therefore acceptable.
Remedial action levels (RALs)	Acceptable	We assume that this element was presented as requested by EPA and is therefore acceptable.
Potentially unacceptable benthic risk areas	Potentially acceptable, use with caution, possibly request or develop additional maps	The general approach to mapping benthic risk seems reasonable. However, we note that empirical toxicity is considered to be the primary line of evidence – if there is no hit in the bioassay, any toxicity predicted by chemistry exceedences is disregarded. There are also some subjective assumptions about where to draw the boundaries of these areas that should be reviewed carefully. We would prefer to see explicit maps of each of the benthic risk lines of evidence, followed by the final map of areas that screen in using the logical process outlined in Section 5.3.1.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
SMAs	Potentially acceptable, use with caution, possibly request or develop additional maps	The SMAs, which are based primarily on the FS dataset and the RALs, seem to be generally appropriate. However, we have some concerns about assumptions made in the interpolation, particularly in areas with low data density (see Section 5.3.3). For each contaminant, a buffer distance was developed from the average distance between sample points; the buffer was used to mask out any areas with interpolated concentrations above RALs that are beyond the buffer distance from any point. This may result in inaccurate acreages and estimates of volumes, particularly in river miles (RMs) 6–8, and the implications of this assumption should be reviewed carefully. We would prefer to see additional samples in areas of uncertainty on the margins of SMAs. Additionally, it appears that the maps do not include all areas that exceed the RALs. The FS does not include areas where the average concentrations do not pose potentially unacceptable risks from benzo(a)pyrene, even if some areas do exceed the RALs (such as Swan Island Lagoon; see p. 5-4). The FS also does not include areas with benzo(a)pyrene and polychlorinated biphenyl (PCB) concentrations greater than the RALs outside of the areas of potential concern (AOPC) boundaries (see p. 5-8). There is no explanation of how many areas were removed, where they were, or what the nature of exceedences may have been. We would prefer to see explicit maps of all of the RAL exceedences, as well as the final SMAs, and some explanation of why specific areas were not included.
Sub-SMAs	Acceptable, review structures for potential for removal	We agree that information about uses is useful for determining the feasibility of remedial technologies. However, we disagree that all structures affect implementability of dredging. A review of structures should be conducted to see which are potentially removable or replaceable.
Oregon hot spot evaluation	No comment	We defer to the State of Oregon on whether this evaluation is acceptable.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Evaluation of buried contamination	Unacceptable, needs additional work	We find the evaluation of buried contamination to be flawed in that it does not provide sufficient information to make informed decisions about remediation. The hydrodynamic and sediment transport model is used to predict the potential for erosion of bedded sediments, and it concludes that this is not a concern (see Section 5.6.1). As expressed elsewhere in this memorandum, we have concerns about conclusions drawn from the models at this time. Additionally, the potential for exposure of buried contamination from dredging was only evaluated in designated future dredge areas (see Section 5.6.4) and the navigation channel (see Section 5.6.5). There is no analysis presented of where buried contamination exists outside of these areas, and therefore no clearly presented way to determine which buried contamination should be of concern. We request that an analysis be done that looks at buried contamination throughout the study area. Using that information, reasonable decisions can then be made about the potential risks of leaving that contamination in place.
Remedial technologies	Generally acceptable, concerns noted in subsequent comments	The types of remedial technologies considered are reasonable for a site such as Portland Harbor. However, we have concerns about the screening of several of these technologies, which are expressed below. We do not have any concerns on the screening of the other technologies.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Remedial technologies – Monitored Natural Recovery (MNR)	Unacceptable, needs additional work	The effectiveness of MNR was evaluated by empirical lines of evidence and predictive modeling. We are concerned that the effectiveness of MNR is not adequately evaluated and warrants further empirical sampling. Many of the empirical lines of evidence are overly generalized and may not hold true on smaller scales. For example, net sedimentation rates are used to indicate that the study area is depositional on average and in most areas. Similarly, lateral averaging of the net sedimentation rates (Figure 6.2-4) is inappropriate and not meaningful. The sediment cores collected from quiescent areas show no trends that would support a pattern of regular deposition. Additionally, there are areas of the harbor that do not exhibit net deposition over the 7-year period examined (see Figure 6.2-15). Even areas with net deposition over the 7-year period may experience shorter periods of net erosion, which could expose contaminated sediments. MNR is also unlikely to be effective for some contaminants. As noted in the FS (footnote 4, p. 6-14), incoming sediments have concentrations of dichlorodiphenyldichloroethylene (DDE) that are similar to average surface sediment concentrations. Therefore MNR is unlikely to be effective for DDE outside of the areas with high DDE concentrations. The evaluation of temporal trends in surface sediment is inconclusive and not a strong line of evidence in support of MNR. The data were not collected in a manner appropriate for temporal trend analysis, and are highly variable, resulting in no significant trends. The weight-of-evidence approach in support of MNR considers surface-to-subsurface concentration ratios of PCBs. A large portion of the site includes areas that have higher surface PCB concentrations than subsurface PCB concentrations, suggesting that MNR would not be effective in many areas. This line of evidence only considers PCBs, but other contaminants should also be considered when evaluating the effectiveness of MNR.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Remedial technologies – Monitored Natural Recovery (MNR) (cont.)		The weight-of-evidence approach in support of MNR also relies on predictive modeling from the sediment transport model. We have expressed concerns with this model elsewhere in this memorandum, and are concerned that it is overly optimistic in its predictions of sedimentation rates. Figure 6.2-21 presents the results of the MNR lines of evidence in three categories: "areas expected to recover, areas where recovery is less certain, and areas where recovery is uncertain." The lines of evidence appear somewhat inconsistent with each other. Of particular concern is that the surface-to-subsurface concentration ratios are not consistent with the net sedimentation rate and grain size lines of evidence, suggesting that net sedimentation is not correlated with lower surface sediment concentrations. We recommend disregarding this summary evaluation.
Remedial technologies – active capping	Generally acceptable, one minor concern	In general, the evaluation of active capping is appropriate. However, the effectiveness evaluation for active capping assumes that groundwater plumes in SMAs 9U and 14 will be controlled and will naturally attenuate. The timeframe for attenuation is not discussed; ongoing contamination from groundwater may affect the short-term (and possibly long-term) effectiveness of active capping.
Remedial technologies – removal	Generally acceptable, may need some rethinking	In general, the evaluation of removal is appropriate. However, we disagree with the sub-SMA limitations in Section 6.2.7.2.1 in that structures should be evaluated for the potential for removal or replacement, rather than simply assuming that removal is infeasible in their vicinity. The Lower Williamette Group bases this assumption on the costs of removal and replacement of structures, which is more appropriately addressed under costs. Additionally, Section 6.2.7.3 on Best Management Practices (BMPs) inappropriately disregards some technologies. Silt curtains and rigid containment should continue to be considered as BMPs in areas where they may be effective, particularly as controls on suspended sediment.
Alternatives	Generally acceptable, may need some rethinking	The series of alternatives is reasonable. However, we would recommend removing the dredging-focused and integrated distinction for each alternative and instead focus on the most reasonable combination of technologies for contamination at each location.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Technology assignments	Generally acceptable, may need some rethinking	The technologies used are reasonable and appropriate for this site. However, we recommend that hydraulic dredging also be considered as an alternative to mechanical dredging in some areas. Additionally, we believe that the assignment of a technology should be based not only on the information about site characteristics that informs feasibility (defined as sub-SMAs in the FS), but also on the degree of contamination and the observed and predicted nature of erosion and deposition.
Disposal options	Generally acceptable, may need some rethinking and additional work	As with technology assignments, the decision of where to dispose of sediments should be based on the nature of the contamination in the sediment and the feasibility of the disposal sites. The sediments with the highest levels of contamination should not remain in Portland Harbor or be placed elsewhere in the Willamette River; they should be placed in appropriate upland disposal sites. The selection of disposal sites should be grounded in reality – we recommend removing disposal sites that are unlikely to be approved from the FS evaluation. Finally, we believe that additional opportunities for disposal should be considered that were not included in the FS, such as the construction of a dedicated Portland Harbor facility.
Construction sequencing and durations	Unacceptable, use base information and rethink	The construction sequencing is inappropriate in that it does not address the most contaminated areas first. The durations of construction are also inappropriately constrained. We recommend using the available information in the FS to design an appropriate sequencing for each alternative that addresses the areas posing the highest risk first, and maximizes efficiencies to complete the remedy in the shortest reasonable timeframe.
Dredge volume determination	Generally acceptable, adjust as necessary	The approach for dredge volume determination is generally appropriate. The determination may need to be adjusted if changes are made that affect the SMA footprints.
Cost estimates	Unacceptable, use base information and rethink	Primarily because of our concerns with construction sequencing and durations, we find the cost estimates unacceptable. We have no reason to dispute the base information and believe that the cost estimates can be reworked relying on the available information.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Evaluation of alternatives	Unacceptable presentation/ interpretation of results	The evaluation of alternatives will need to be redone to incorporate changes made to the evaluations that support it. Additionally, the scoring of alternatives should be completely reworked. The scoring methods are buried in Table 7.1-1 of Appendix U and not presented clearly in the main text of the document. The methods for scoring the alternatives currently apply criteria and scores for integrated alternatives that are different from those for removal-focused alternatives, which is entirely inappropriate. Additionally, many of the categories are based all or in part on the duration of the alternative, which, as mentioned above, should be reevaluated. This heavy emphasis on inappropriate estimates of durations appears designed to make the more active alternatives appear less desirable and more expensive.
Fate and transport modeling	Unacceptable presentation/ interpretation of results	We have significant concerns about the fate and transport modeling used to evaluate the long-term effectiveness of the alternatives. Our main concerns, described here, are based on a review of the draft FS text. We have not conducted an evaluation of the model itself, as we understand that the Army Corps of Engineers is conducting that level of evaluation. Our first major concern has to do with the scale at which model results are presented. Model results are averaged across the channel and across RMs, and in some cases, across the entire site (~ 10 miles). In contrast, areas of contaminated sediment are generally within a localized area in a specific SMA or hot spot, typically near a river bank. The use of averaged results makes it very difficult to evaluate the predicted changes in chemical of concern (COC) concentrations in localized areas in response to remedial actions. The model results should present localized changes in COC concentrations for smaller, relevant areas, such as hot spots and SMAs, such that changes in risk can be evaluated. Our second major concern is that the model is not transparent. Appendix Ha states that "since its development, the QEAFATE code has been continually improved and updated by Anchor QEA (formerly QEC) personnel" (Appendix Ha, p. 17). Although this code is based on a public domain code (WASTOX, which also formed the basis for the EPA-supported model WASP), QEAFATE is not maintained by a public agency. It is not open source or available in the public domain. As such, it is less "transparent" than a public domain code supported and maintained by a public agency such as the EPA or the U.S. Geological Survey. Appendix Ha does not describe how this code has been modified and maintained by Anchor QEA, or how changes to the code have been verified. This lack of transparency reduces confidence in the code. Appropriate references describing code modifications, testing, and maintenance should be provided.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Fate and transport modeling (cont.)		Our third major concern is how the model is used to support MNR as a remedial technology. For most of the COCs that are not expected to degrade in the environment, MNR depends on the simulated deposition of less contaminated sediments over more contaminated sediments. MNR thus requires areas to be depositional, and upstream sediments to be less contaminated than site sediments. Issues related to the simulation of sediment deposition and erosion are described in the sediment transport modeling comments below. For some contaminants, upstream sediment concentrations indicate that MNR is unlikely to be effective. For example, Figure 6.2-7 demonstrates that incoming sediments have concentrations of DDE that are similar to average surface sediment concentrations. Our fourth major concern is that the model appears to use unrealistic assumptions that are not representative of site conditions. It was used to estimate natural recovery rates using a tracer. The FS states, "This sediment transport modeling was conducted as a "bed tracer" simulation, in which a unit concentration (of 100) was specified throughout the sediment bed (i.e., laterally and vertically uniform) at the beginning of the simulation, and incoming particles from upstream were assigned a concentration of zero" (FS, p. 6-26). Figures 6.2-20a–d provide half-lives ranging from 5 to 49 years, apparently representing the time when the sediment concentration is half of the initial concentration. In reality, for all COCs, the upstream concentration is far above zero. For example, the mass balance analysis for the model indicates that 50% of the upstream load for PCBs and 90% of the DDE load enter from upstream (App. Ha, p. 59). Upstream DDE sediment concentrations are similar to observed surface sediment concentrations (Figure 6.2-7). The assumption of zero for upstream concentrations results in half-life calculations that significantly underestimate the time for concentrations to drop to 50% of current concentrations, thus underestimating the time for recovery. The half-lives calculated from this analysis are not representative of site conditions.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Sediment transport modeling	Unacceptable presentation/ interpretation of results	We have significant concerns about the sediment transport modeling used to support the evaluation of alternatives. Our main concerns, described here, are based on a review of the draft FS text. We have not conducted an evaluation of the model itself, as we understand that the Army Corps of Engineers is conducting that level of evaluation. Although the scale of the evaluation is appropriate, the presentation of results is summarized over the entire study area. The modeling concludes that the harbor is "net depositional" (Appendix La, p. 50) based on averages for the site as a whole. However, the spatial and temporal patterns of erosion and deposition in localized hot spots and SMAs are critical to predicting sediment COC concentrations. Monitoring of sediment from 2003 to 2009 (Figure 6.2-1) indicates that many of the highly contaminated areas, including along the banks, are net erosional. The model relies on selected data on bed elevation change, and inappropriately excludes a portion of the available information. Although bed elevation change data are available from 2002 to 2009, the data from January 2002 to May 2003 were considered "anomalous." This was because although the incoming sediment load was similar to that of other years, bed elevation change data indicated that this timeframe was net erosional (Appendix La, p. 39). The model was only calibrated to data from May 2003 to January 2009, excluding data from the erosional time period. Exclusion of these data may result in the model underestimating the erosion rates and over-predicting deposition. Furthermore, the calibrated model under-predicted the extent of erosion from 2003 to 2009 – 12% versus 17% for predicted and observed, respectively (Appendix La, Figure 2-68). Figures that show how the model predicted and observed bed elevation changes "disagree" or "agree" (Figures 2-76 to 2-79) should focus on SMAs or smaller areas with high contaminant concentrations. The nature of the disagreement in contaminated areas is critical. If the model is predicting deposition in an area with high COC concentrations where erosion has been observed, this undercuts the reliability of the model for evaluating MNR and the effectiveness of remedial actions.

Table 1. Comments on elements of FS (cont.)

Element	Opinion	Discussion
Sediment transport modeling (cont.)		Because output from the hydrodynamic model feeds into the sediment transport model but the sediment transport model does not feed back into the hydrodynamic model (Appendix La, p. 9), any substantial changes to the bathymetry over time will not be reflected in the hydrodynamic model. The text states that "successful calibration and validation of the model indicate that this limitation in the modeling framework does not have a significant effect on the predictive capabilities of the sediment transport model in the Lower Willamette River" (Appendix La, p. 9). The calibration of the model to 2003–2009 data does not prove that the one-way simulation has no effect on its predictive capabilities. This assumption should be justified in much more detail. The sensitivity of the hydrodynamic model could be evaluated by importing the simulated, altered bathymetry into the hydrodynamic model and running it.
HEC-RAS hydrodynamic model	No comment	We have not identified any concerns with the HEC-RAS model at this time.
Bioaccumulation model	No comment	We have not identified any concerns with the bioaccumulation model at this time.